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(51) INT CL<sup>6</sup>  
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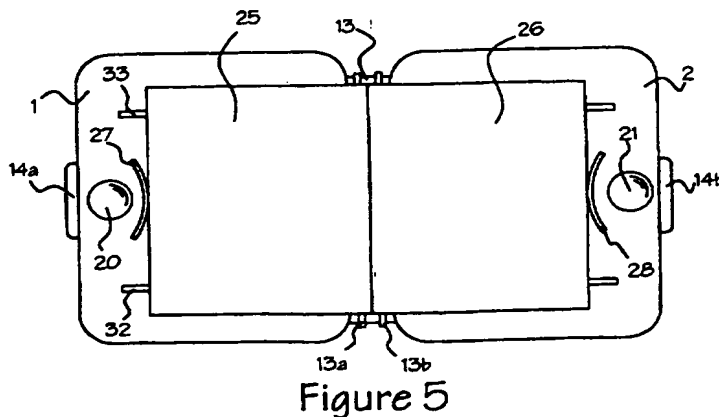
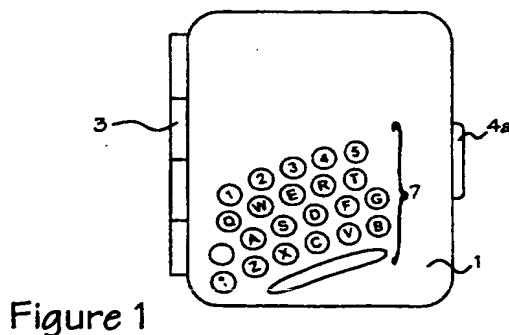
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G4A ADT  
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JP 070295720 A US 5515305 A US 5467102 A  
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On-line: COMPUTER, INSPEC, WPI

## (54) Display and input arrangements for portable electronic apparatus

(57) A portable electronic apparatus has user input means 7 (8, Fig 2) for example a keyboard or tilt switches, disposed in back-to-back relation to a display. The apparatus may be hinged such that it can be opened and closed in the manner of a book, in which case the display may be either in two parts 25, 26, that can be brought together when the apparatus is open or flexible so that it can fold on itself when the apparatus is closed. The apparatus may be a computer and/or mobile telephone.



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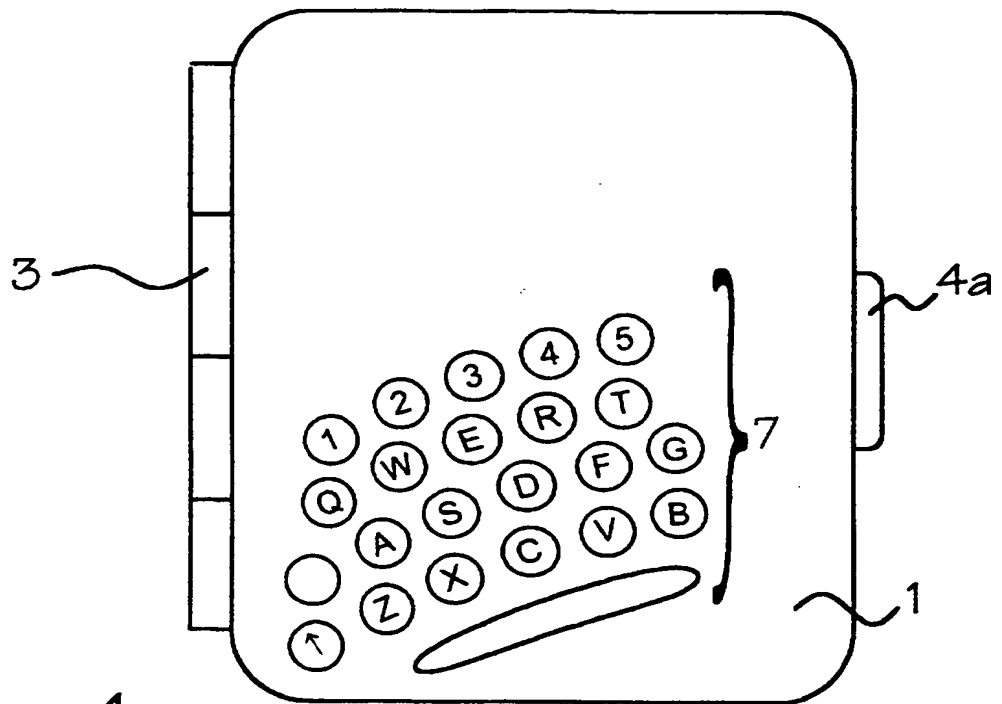


Figure 1

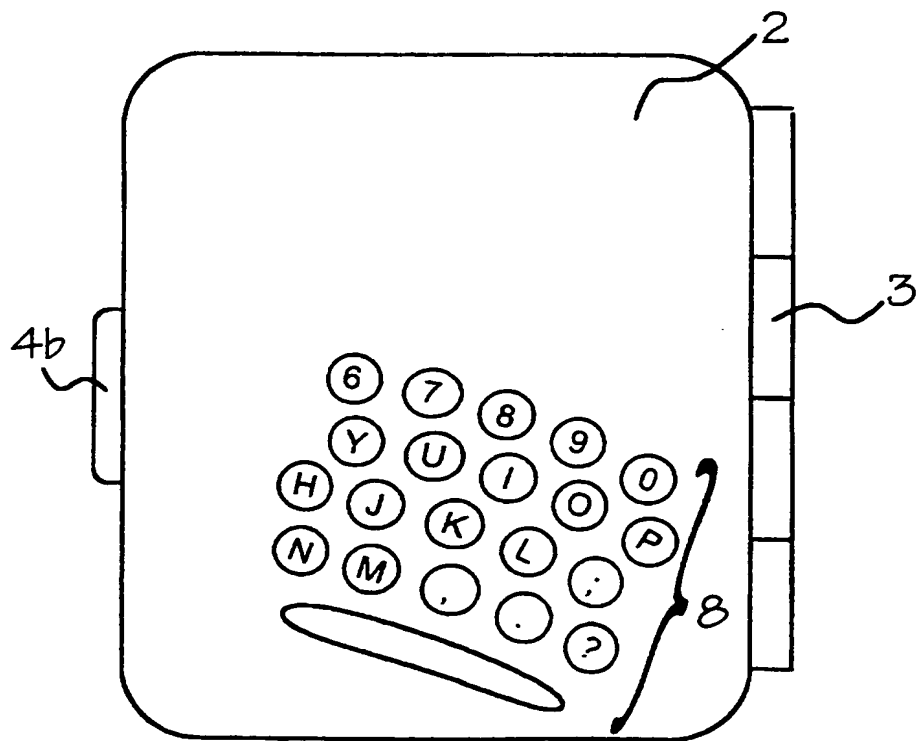


Figure 2

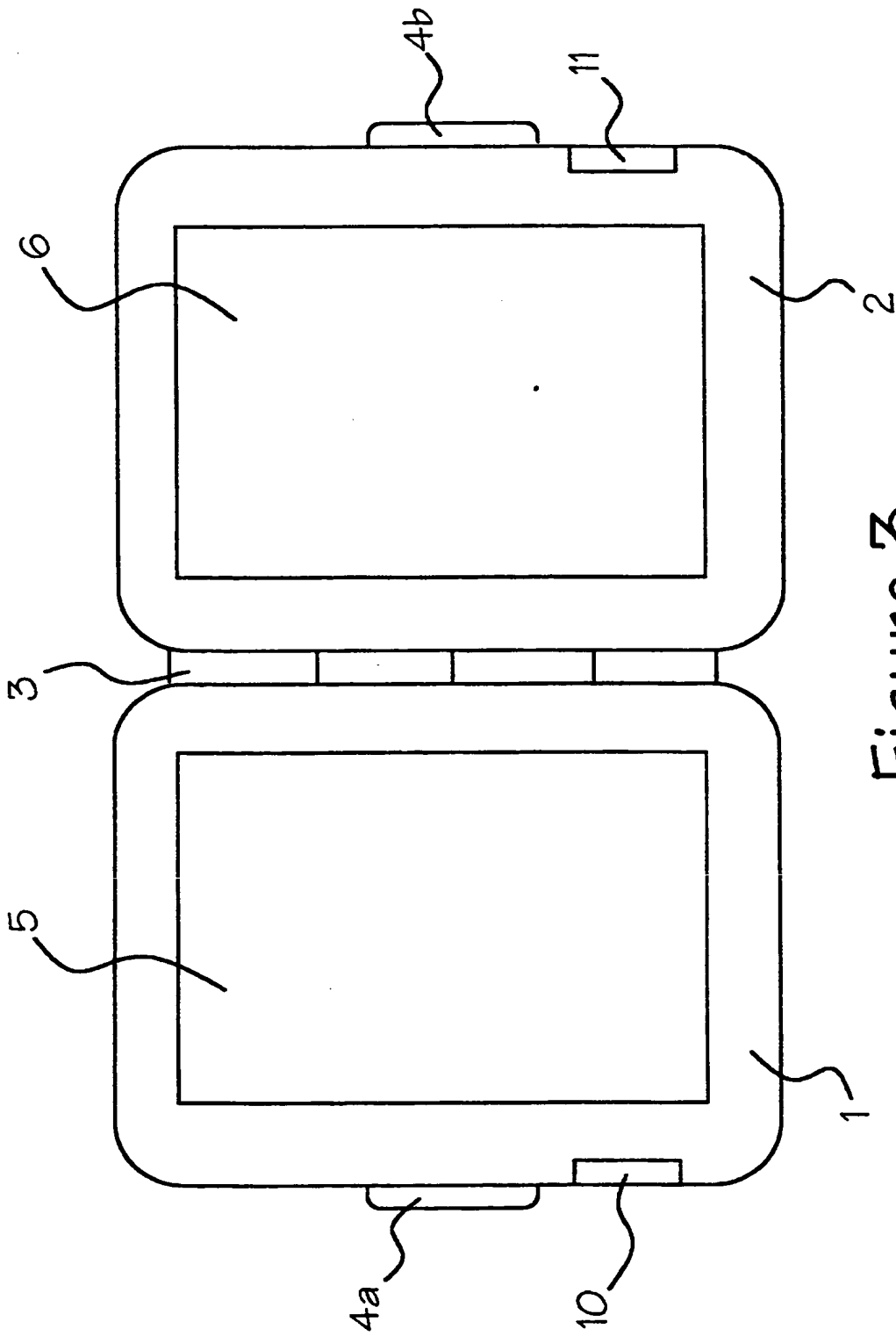


Figure 3

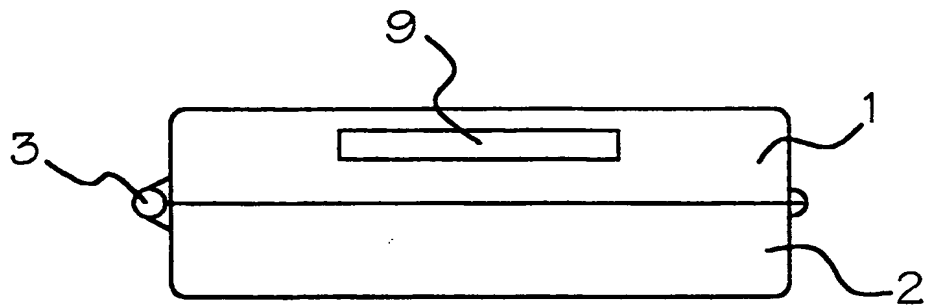


Figure 4

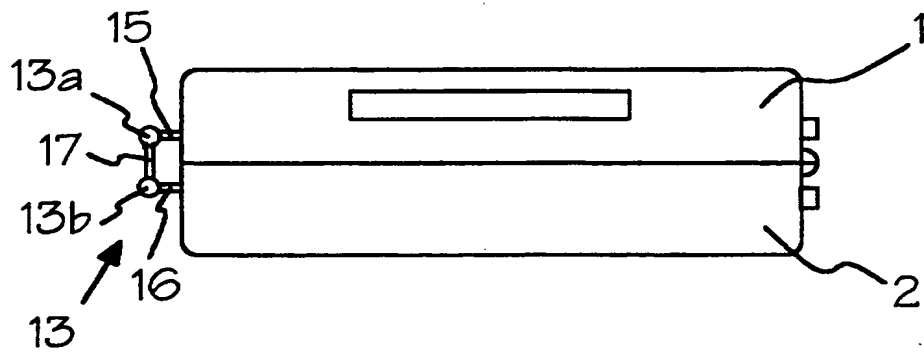


Figure 6

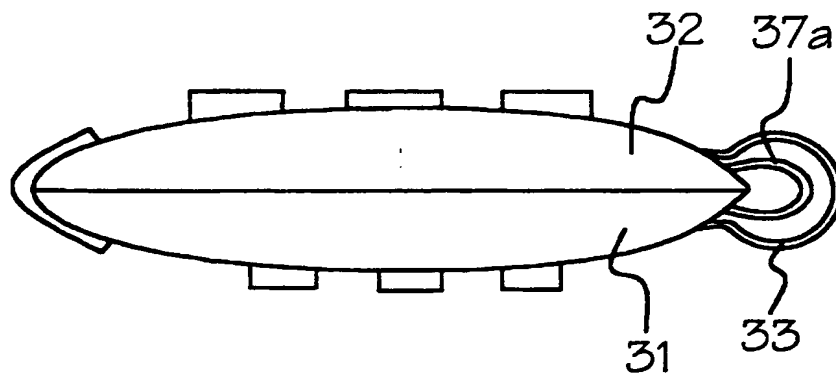


Figure 11

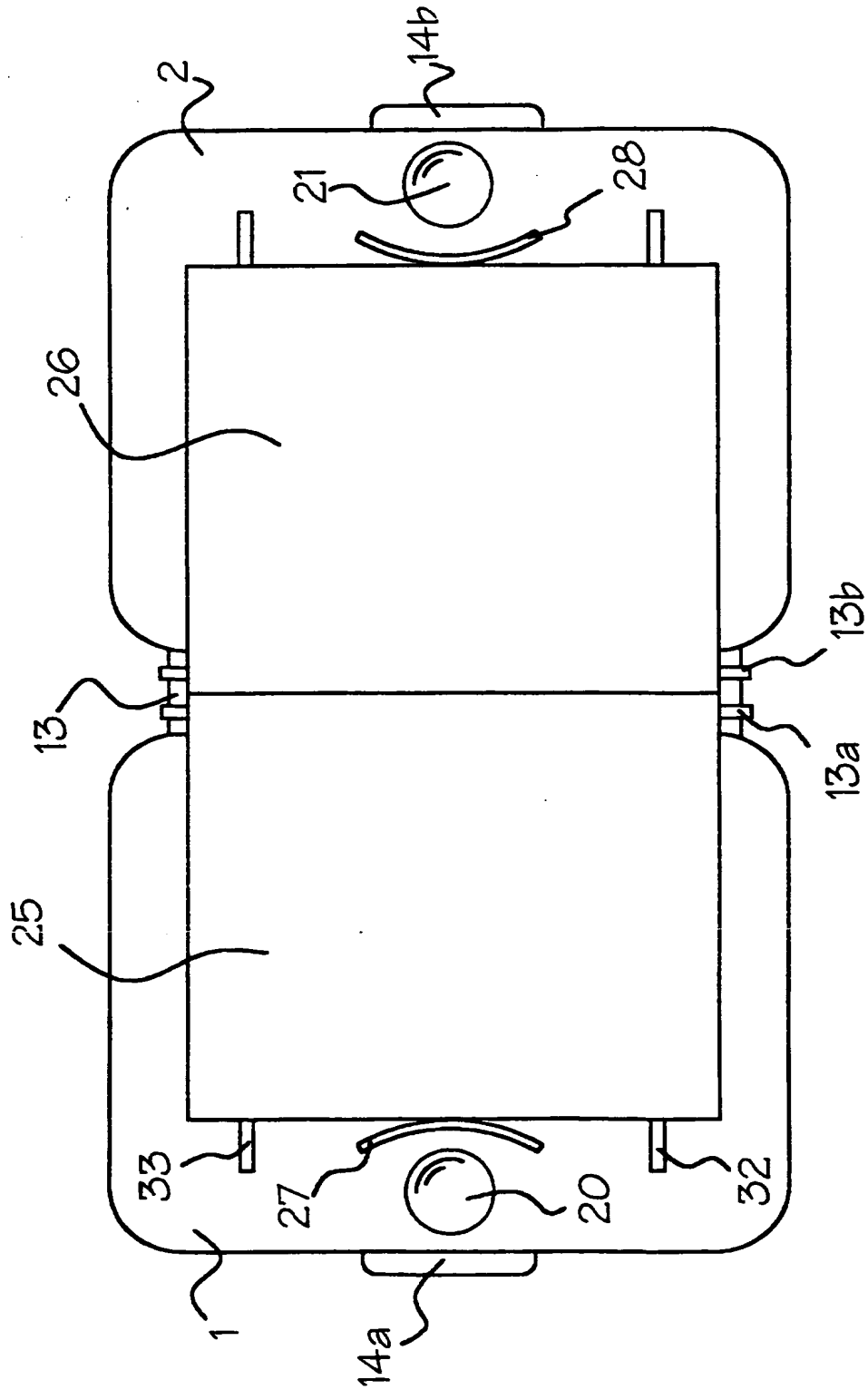


Figure 5

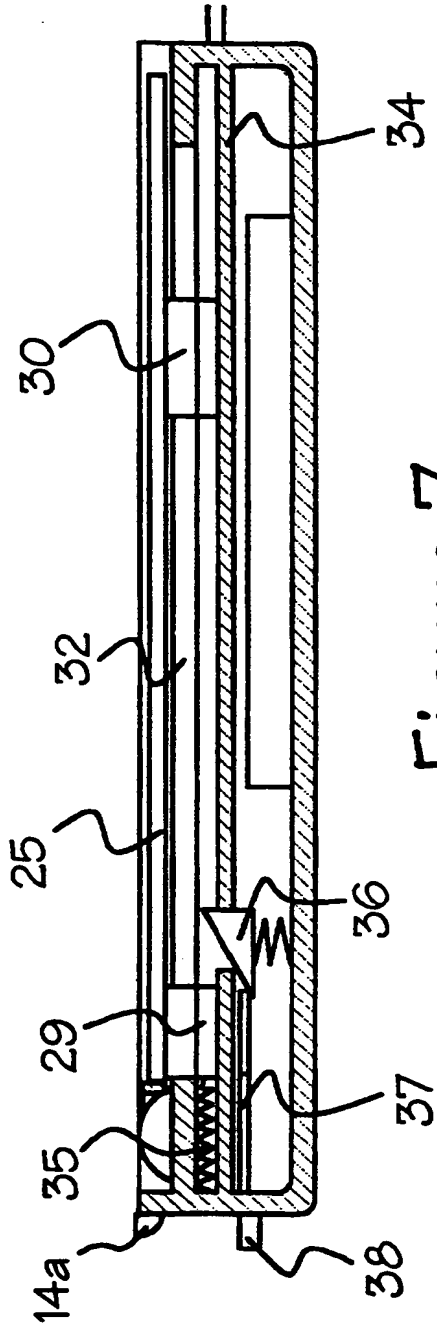


Figure 7

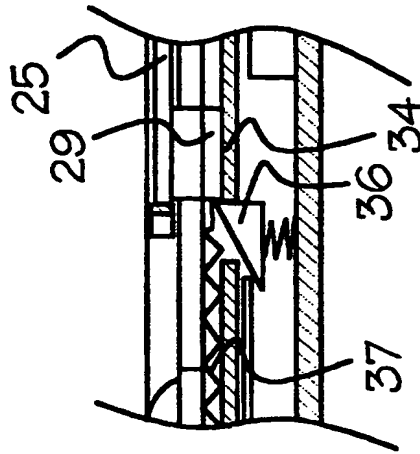


Figure 8

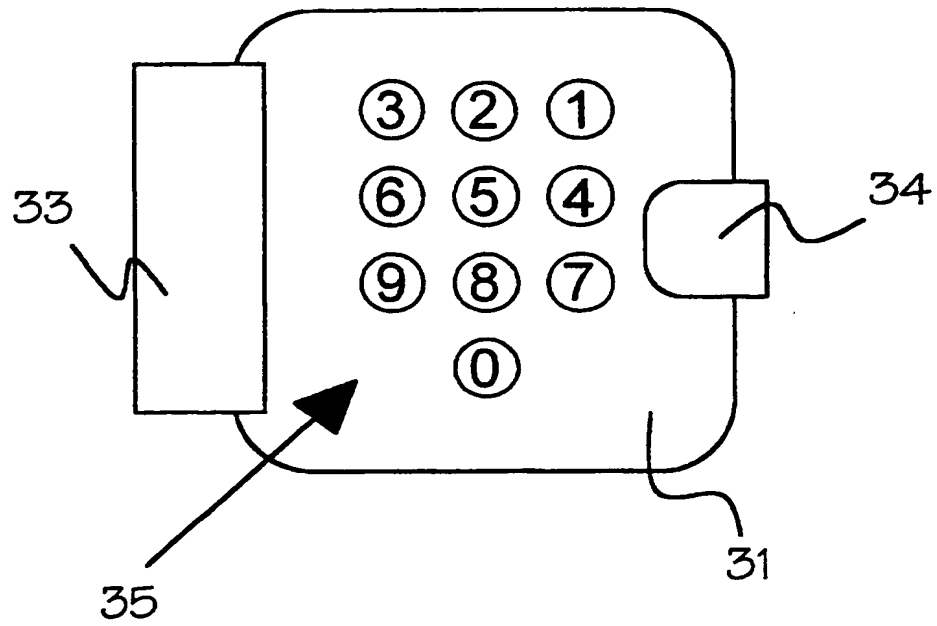


Figure 9

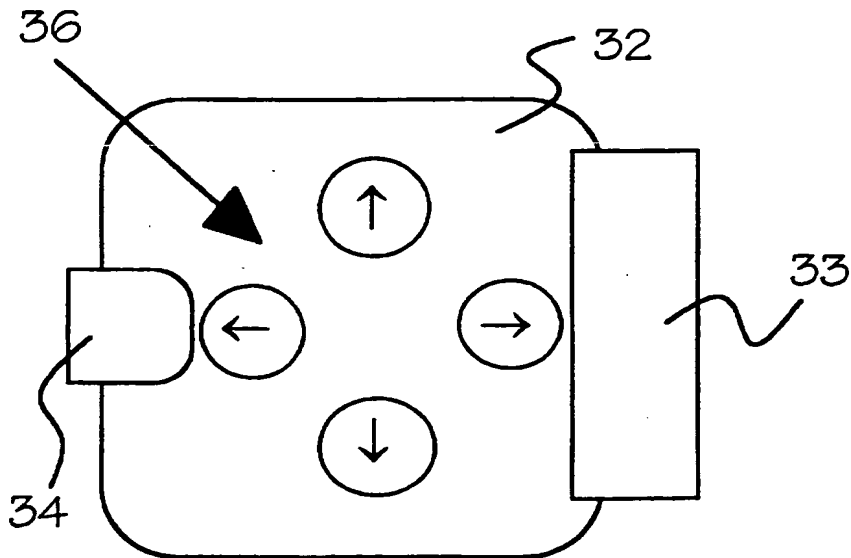


Figure 10

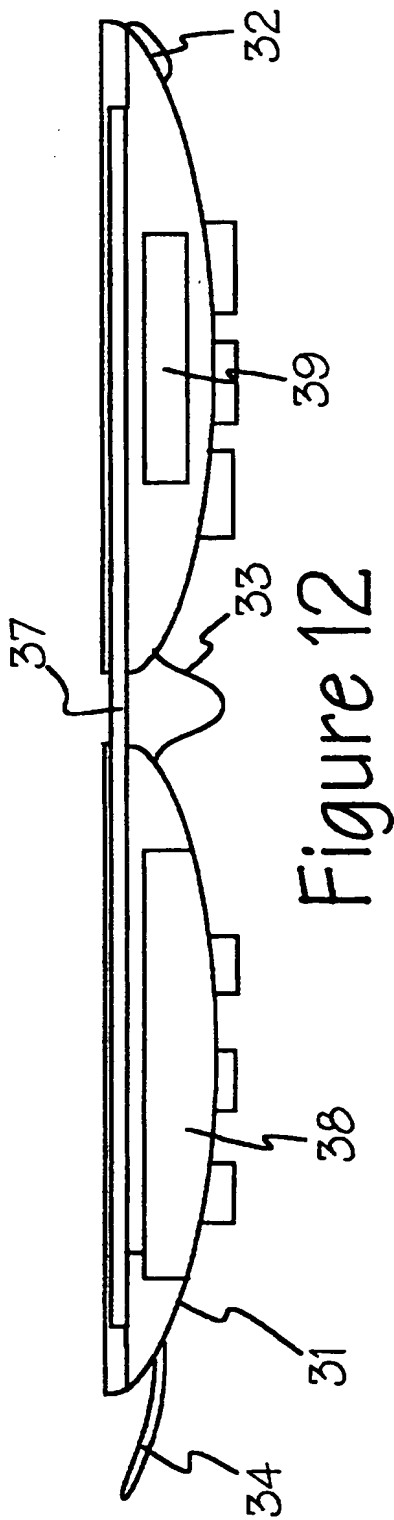


Figure 12

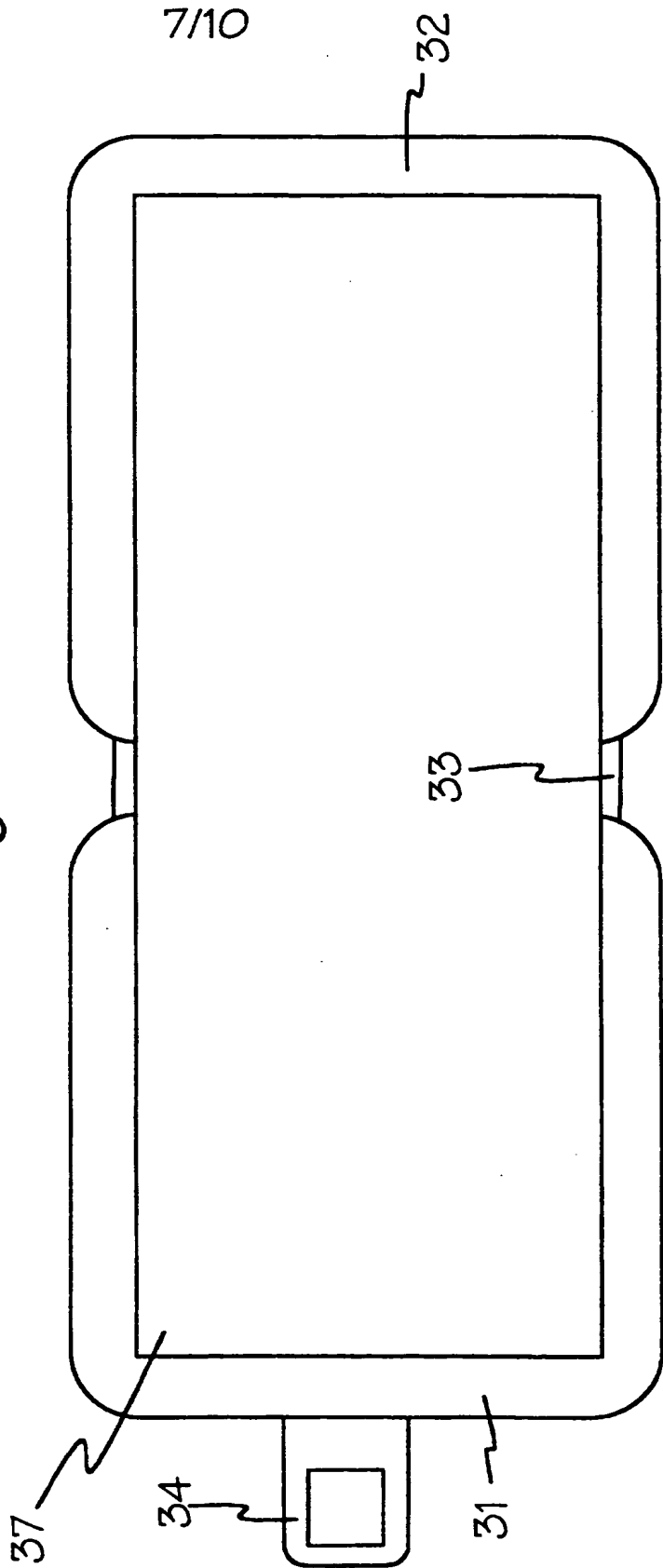


Figure 13



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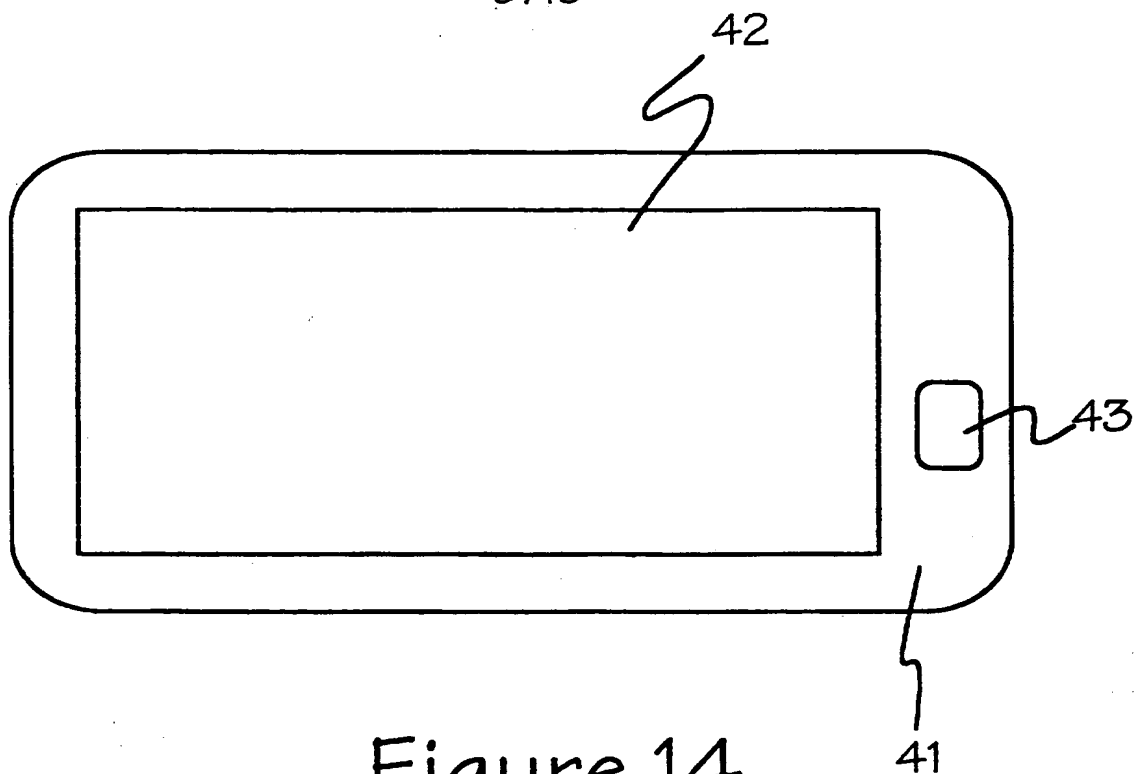


Figure 14

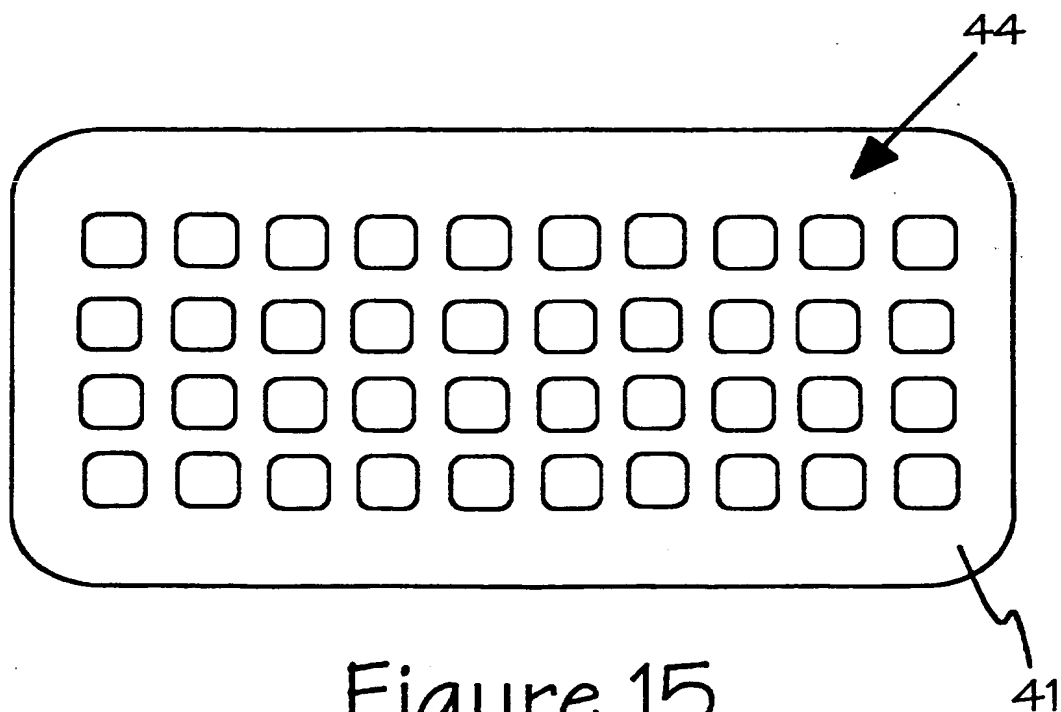


Figure 15

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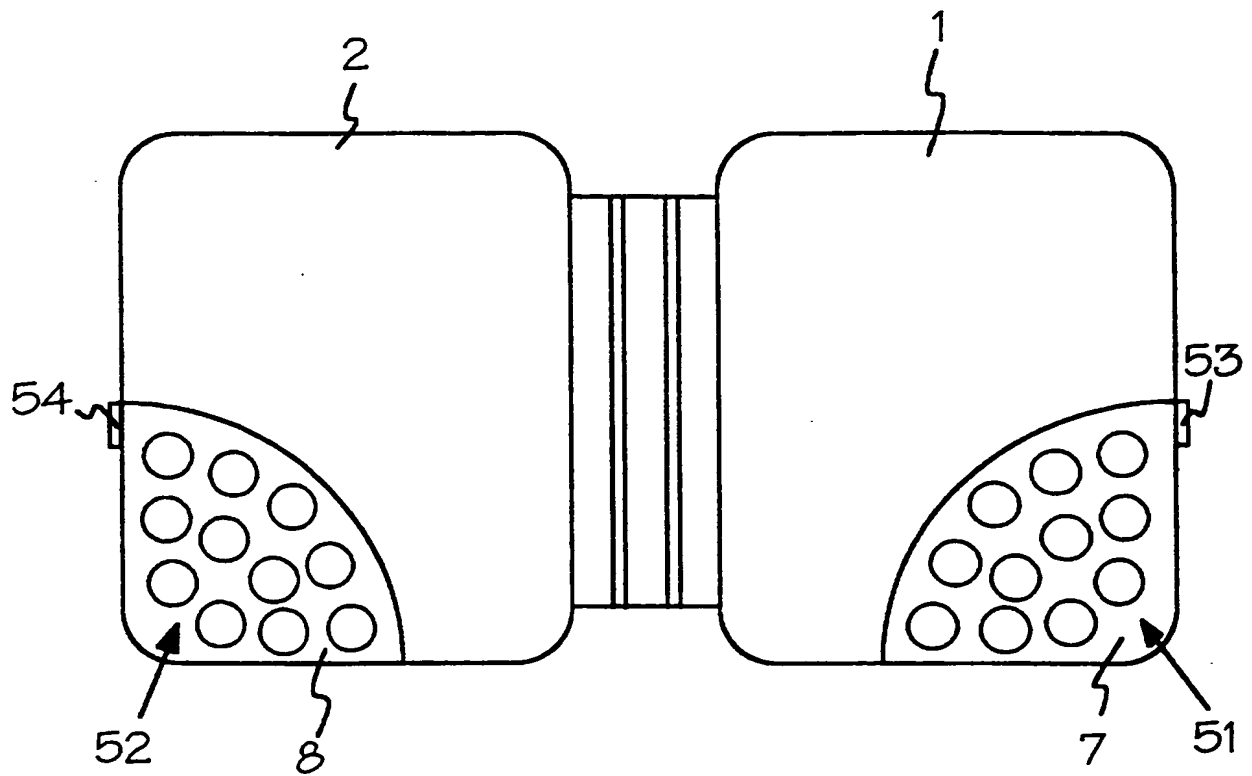


Figure 16

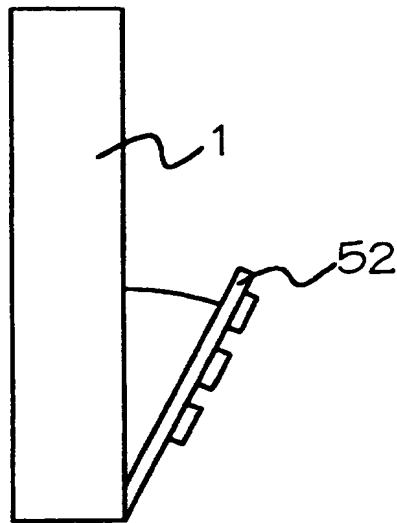


Figure 17

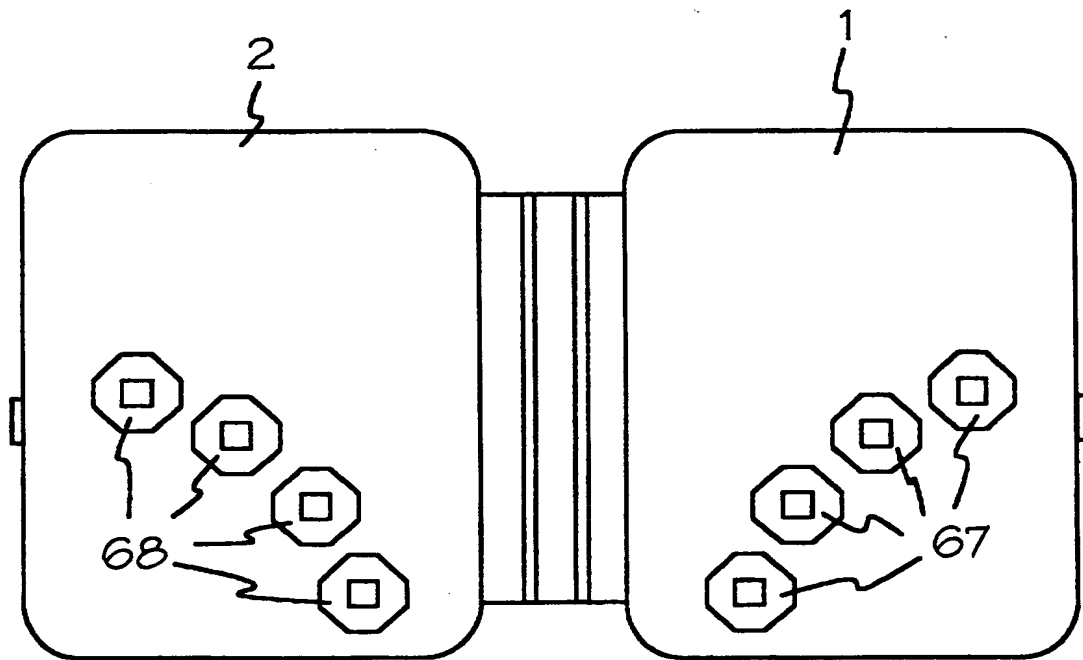


Figure 18

## Portable Electronic Apparatus

### Description

The present invention relates to a portable electronic apparatus having a display and user input means.

Known portable or "lap top" computers and personal organizer generally comprise two portions hinged together so that the apparatus can be opened and closed in the manner of a book. A keyboard and a display are located on the inside faces of respective portions.

This arrangement has the disadvantage that the apparatus must be large to accommodate both the display and the keyboard in the same plane when in use.

It is an aim of the present invention to overcome this problem.

According to the present invention, there is provided a portable electronic apparatus having a display and a user input means disposed back-to-back on opposite sides of a body portion. Consequently, the apparatus need only be big enough to accommodate the larger of the display and the user input means.

A portable electronic apparatus according to the present invention may be a computer. However, the present invention is more generally applicable to apparatus including processing means, such as a microprocessor. For instance, the present invention may be applied to mobile telephone apparatus or combined mobile telephone and computer apparatus.

Preferably, an apparatus according to the present invention comprises first and second body portions hinged together such that the apparatus can be opened and closed in the manner of a book, the display panel being located at the

inside face of one of said portions and the user input means being located at an outside face of one of said portions. Conveniently, the user input means may be distributed between the body portion.

5 Preferably, the display panel extends over both portions. This may be achieved by employing a flexible display device or by constructing the panel in two parts which can move into abutment when the device is opened.

10 In an alternative embodiment, a display panel is located on the inside face of each said portion. Such an arrangement is particularly suited to use in an electronic book apparatus. Such an apparatus advantageously includes means for reading from a data carrier, e.g. a CD-ROM. The text of the "book" can then be displayed as two facing pages in the manner of a conventional paper book.

15 Preferably, the or each display panel comprises a light emitting polymer display device.

20 The user input means may comprise a keyboard means. Conveniently, the keyboard means will comprise a membrane keyboard. However, other keyboard structures may be used as appropriate. For instance, a chord keyboard may be provided.

25 According to the present invention, there is also provided a portable electronic apparatus comprising first and second body portions hinged together such that the apparatus can be opened and closed in the manner of a book, and a display panel extending over the inside faces said portions.

30 According to the present invention, there is further provided a manually operable input device comprising a plurality of tilt switches, wherein a plurality of different characters are represented by the making of respective contacts of said switches.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a first side view of a first embodiment of the present invention in its closed configuration;

5 Figure 2 is a second side view of the apparatus of Figure 1;

Figure 3 shows the inside faces of the apparatus of Figure 1 in its open configuration;

Figure 4 is a top view of the apparatus of Figure 1;

10 Figure 5 shows the inside faces of a second embodiment of the present invention;

Figure 6 is a top view of the apparatus of Figure 5;

Figure 7 is a sectional view of one half of the apparatus of Figure 5 with the display panel portion retracted;

15 Figure 8 is a detailed view of the region circled in Figure 7 but with the display panel portion extended;

Figure 9 is a first side view of a third embodiment of the present invention in its closed configuration;

Figure 10 is a second side view of the apparatus of Figure 9;

20 Figure 11 is a top view of the apparatus of Figure 9 in its closed configuration;

Figure 12 is a bottom view of the apparatus of Figure 9 in its open configuration;

Figure 13 shows the inside faces of the apparatus of Figure 9;

Figure 14 is a front view of a fourth embodiment of the present invention;

25 Figure 15 is a back view of the apparatus of Figure 14.

Figure 16 is a back view of a fifth embodiment of the present invention in its open configuration;

Figure 17 is a side view of the apparatus of Figure 16; and

30 Figure 18 is a back view of a sixth embodiment of the present invention in its open configuration.

Referring to Figures 1 to 4, a first embodiment of the present invention

comprises first and second body portions 1, 2. The body portions 1, 2 are rectangular in both plan and section and are coupled by a hinge 3 such that the apparatus may be opened and closed in the manner of a book. First and second co-operating catch elements 4a, 4b are located on respective body portions 1, 2, midway along the faces remote from the hinge 3. The catch elements 4a, 4b co-operate to hold the apparatus in its closed configuration.

A first LCD panel 5 is located at the inside face of the first body portion 1 and a second LCD panel 6 is similarly located at the second body portion 2. The keys 7, 8 of a keyboard are distributed between the outside faces of the body portions 1, 2. The keys 7, 8 are of the membrane type. The keys 7, 8 are supplemented by additional keys 10, 11 in the margins of the inside faces of respective body portions 1, 2, positioned to be operated conveniently by a user's thumbs. The additional keys 10, 11 provide the "ENTER" function for the keyboard.

The first body portion 1 houses microcomputer circuitry and a CD-ROM drive. A slot 9 is provided in the upper face of the first body portion 1 to provide access to the CD-ROM drive for the insertion and removal of CD-ROMs. A battery pack is housed in the second body portion 2.

The microcomputer circuitry is substantially standard and such as one would find in a "palm top" computer. However, its display interface is modified to control the two LCD panels 5, 6.

The microcomputer circuitry is programmed with useful programs, such as a diary program, a calculator program, a communications program (should the apparatus include a modem or means to couple it to a modem) and a word processor. However, this embodiment is particularly suited for use as an electronic book. For this use, the microcomputer circuitry is programmed to read text and graphics data from a CD-ROM and display them on the LCD panels 5, 6 in the manner of the facing pages of a book. The microcomputer

circuitry is further programmed to respond to operation of the further keys 10, 11 to cause the displayed "pages" to change in the manner of the pages of a book being turned.

5 Referring to Figures 5 to 8, a second embodiment of the present invention comprises first and second body portions 1, 2. The body portions 1, 2 are rectangular in both plan and section and are coupled by a hinge 13 such that the apparatus may be opened and closed in the manner of a book. First and second co-operating catch elements 14a, 14b are located on respective body  
10 portions 1, 2, midway along the faces remote from the hinge 13. The catch elements 14a, 14b co-operate to hold the apparatus in its closed configuration.

The hinge 13 must not project above the inside faces of the body portions 1, 2 when the apparatus is in its open configuration. To achieve this, the hinge 13  
15 comprises first and second parallel, elongate pivots 13a, 13b. The first pivot 13a is coupled to the spine face of the first body portion 1 by a first strip-like element 15. The second pivot 13b is similarly coupled to the second body portion 2 by a second strip-like element 16. A third strip-like element 17 couples the pivots 13a, 13b to each other. When the apparatus is in its closed  
20 configuration, the first and second strip-like elements 15, 16 are at right angles to the third strip-like element 17. However, when the apparatus is in its open condition the strip-like elements 15, 16, 17 all lie in the same plane.

A keyboard, as described above, is distributed between the outside faces of the  
25 body portions 1, 2. The additional keys 10, 11 of the first embodiment are replaced by first and second track balls 20, 21 located in the margins of the inside faces of respective body portions 1, 2, adjacent the catch elements 14a, 14b.

30 A display comprises first and second light emitting polymer display panels 25, 26. The display panels 25, 26 are slidably mounted to the inside faces of respective body portions 1, 2. When the apparatus is in its closed



configurations, the display panels 25, 26 are retracted away from the hinge 13. Once the apparatus has been opened flat, the display panels 25, 26 are pushed by a user, using tabs 27, 28 on the edges of the panels 25, 26 remote from the hinge 13, towards the hinge 13 such that they abut each other.

5 Referring particularly to Figures 7 and 8, the first display panel 25 is provided with first and second pairs of T-section lugs. The first pair of lugs 29 is located towards the outer edge of the panel 25 and the second pair 30 is located towards the inner edge of the panel 25. One lug 29, 30 of each pair is  
10 received in one of a pair of slots 32, 33. A panel 34 is located beneath and in contact with the lugs 29, 30. Each of the first pair of lugs 29 is coupled to the wall of the body portion 1, removed from the hinge 13, by a spring 35. The springs 35 are arranged to be placed under tension when the panel 25 is moved towards the hinge 13. The panel 25 is held in its advanced position by  
15 a pair of spring-loaded detents 36 which engage respective lugs 29 of the first pair of lugs. A forked slider 37 engages each of the detents 36 and projects from the body portion 1, adjacent the catch element 14a, to provide a release button 38. When the release 38 button is pressed, the slider 37 bears against the detents 36 in a camming action causing them to be depressed against their  
20 spring loading. Once the detents 36 have been depressed until they no longer project above the panel 34, the panel 25 is free to be retracted by the springs 35 as they relax.

A similar mechanism is provided in the second body portion 2 for the second  
25 display portion 26.

Microcomputer circuitry and a battery pack are located in the body portions 1, 2. A slot 9 is provided in the upper face of the first body portion 1 for receiving ROM cartridges. The microcomputer circuitry is programmed with  
30 parograms such as are conventionally found in electronic personal organizers, such as the Psion Organizer. Of course, the display interface will differ because it needs to drive separate display panels. However, it is known to

display a signal image across two or more screens and the skilled person will not have difficulty adapting the known systems to an apparatus according to the present invention.

- 5 Light emitting polymer (LEP) panels used for the display panels 25, 26 are such as have been developed and patented by Cambridge Display Technology Limited of 181a Huntingdon Road, Cambridge CB3 0DJ. LCD panels require spacers at their peripheries to keep their glass sheets apart and to retain the liquid crystal material. LEP panels do not require this space and pixels can be  
10 located very close to the edges of these panels. Thus, disruption of the displayed image, where the display panels 25, 26 meet, can be minimized .

Referring to Figures 9 to 13, a third embodiment of the present invention comprises first and second moulded plastic body portions 31, 32. The body  
15 portions 31, 32 are rectangular in plan and slightly domed in section and are coupled by a plastic strap hinge 33 such that the apparatus may be opened and closed in the manner of a book. A fastening for holding the apparatus in its closed configuration comprises a tab 34 attached to the first body portion 31. The tab 31 and the second body portion 32 are provided with co-operating  
20 Velcro patches. The apparatus is about the size as a wallet.

A first membrane keypad 35 is located at the outside face of the first body portion 31 and a second membrane keypad 36 is located on the outside face of the second body portion 32.

25

A flexible display panel 37 is mounted to the inside faces of the body portions 31, 32. The display panel 37 comprises a light emitting polymer structure formed on a flexible plastics substrate.

- 30 The strap hinge 33 forms a stiff loop when the apparatus is in its closed configuration. This provides space for the display panel 37 also to form a loop 37a when the apparatus is in its closed configuration. Consequently,

creases in the display panel 37 are avoided. The resolution required of the display panel 37 will depend on the use of the apparatus and if the apparatus is merely a calculator, a low resolution display would be acceptable.

- 5 Microcomputer circuitry 38 and a battery pack 39 are located in respective body portions 31, 32.

Referring to Figures 14 and 15, a fourth embodiment of the present invention comprises a body 41, an LCD panel 42 mounted to the front face of the body,  
10 an ENTER key 43 beside the LCD panel 42 and a keyboard 44 located at the rear face of the body 41. The body 41 contains electronic circuitry for providing "personal organizer" functions.

Referring to Figures 16 and 17, a fifth embodiment of the present invention is  
15 identical to the second embodiment, described above, except for the keyboard arrangement. The keyboard comprises first and second groups of key 57,58 on respective body portions 1,2. The groups of keys 7,8 are located in respective hinged panels 51,52. The hinged panels 51,52 are provided with tabs 53,54 which can be used to tilt the panels 51,52 away from the body  
20 portions 1,2 for use.

Referring to Figure 18, a sixth embodiment of the present invention is identical to the second embodiment, described above, except for the keyboard arrangement. The keyboard comprises two groups of four eight-way tilt  
25 switches 67,68. Each switch 67,68 can be tilted in eight directions each of which causes a connection, representing a different character, to be made. Thus, with eight such switches 64 different characters can be input by a user. Eight-way tilt switches are known from video game consoles.

30 In use, an apparatus, according to the present invention, is held in the manner of an open book so that the display is visible. The keyboard keys are arranged such that they can be operated by the user's fingers when the

apparatus is being held in this manner.

In the foregoing, apparatus according to the present invention has been described with rectangular displays. It will be appreciated that displays of  
5 other shapes can be used. Likewise, apparatus, embodying the present invention, need not be rectangular.

It will be appreciated that apparatus according to the present invention may include any of the various user input devices, e.g. joysticks, pens etc.  
10 Additionally, various data storage devices such as floppy disk drives, hard disk drives, CD-ROM drives and ic or memory cards may be used in an apparatus according to the present invention, either individually or in combination.

Solar panels may be provided in addition to or in place of the batteries  
15 mentioned in the above description.

## Claims

1. A portable electronic apparatus having a display and a user input means disposed back-to-back on opposite sides of a body portion.  
5
2. An apparatus according to claim 1, comprising first and second body portions hinged together such that the apparatus can be opened and closed in the manner of a book, the display panel being located at the inside face of one of said portions and the user input means being located at an outside face of  
10 one of said portions.
3. An apparatus according to claim 2, wherein the display panel extends over both portions.
- 15 4. An apparatus according to claim 3, wherein the display panel comprises first and second display elements, the display elements being movable, when the apparatus is in its open configuration, between spaced and mutually abutting configurations.
- 20 5. An apparatus according to claim 2, wherein the display panel comprises a single flexible display structure.
6. An apparatus according to claim 2, wherein a display panel is located on the inside face of each said body portion.
- 25 7. An apparatus according to any preceding claim, wherein the or each display panel comprises a light emitting polymer display device.
8. An apparatus according to any preceding claim, wherein the user input  
30 means comprises a keyboard means.
9. An apparatus according to claim 6, wherein the keyboard means

comprises a membrane keyboard.

10. An apparatus according to claim 2, wherein the user input means is distributed between said portion.

5 11. An apparatus according to claim 8, 9 or 10, wherein the keyboard means comprises a plurality of keys mounted to a panel, the panel being pivotable between a first position substantially flat with respect to a body portion and a second position angled away from the body portion.

10 12. An apparatus according to claim 11, wherein said panel is arranged to pivot about an axis adjacent to the lower edge of said portion.

13. A portable electronic apparatus comprising first and second body  
15 portions hinged together such that the apparatus can be opened and closed in the manner of a book, and a display panel extending over the inside faces said portions.

14. An apparatus according to claim 13, wherein the display panel  
20 comprises first and second planar display elements, the display elements being movable, when the apparatus is in its open configuration, between spaced and mutually abutting configurations.

15. An apparatus according to claim 13, wherein the display panel  
25 comprises a single flexible display structure.

16. An apparatus according to claim 13, 14 or 15, wherein the display panel comprises a light emitting polymer display device.

30 17. A manually operable input device comprising a plurality of tilt switches, wherein a plurality of different characters are represented by the making of respective contacts of said switches.

18. An apparatus substantially as hereinbefore described with reference to Figures 1 to 4 of the accompanying drawings.

19. An apparatus substantially as hereinbefore described with reference to  
5 Figures 5 to 8 of the accompanying drawings.

20. An apparatus substantially as hereinbefore described with reference to Figures 9 to 13 of the accompanying drawings.

10 21. An apparatus substantially as hereinbefore described with reference to Figures 14 and 15 of the accompanying drawings.

22. An apparatus substantially as hereinbefore described with reference to Figures 16 and 17 of the accompanying drawings.

15

23. An apparatus substantially as hereinbefore described with reference to Figure 18 of the accompanying drawings.

**Amendments to the claims have been filed as follows**

1. A portable electronic apparatus comprising first and second body portions hinged together such that the apparatus can be opened and closed in the manner of a book, and a display panel extending over and between the inside faces of said portions when the apparatus is in its open configuration.
2. An apparatus according to claim 1, wherein the display panel comprises first and second planar display elements, the display elements being movable, when the apparatus is in its open configuration, between spaced and mutually abutting configurations.
3. An apparatus according to claim 1, wherein the display panel comprises a single flexible display structure.
4. An apparatus according to claim 1, 2 or 3, wherein the display panel comprises a light emitting polymer display device.
5. An apparatus according to any preceding claim, having a user input means disposed in back-to-back relation to the display panel.
6. An apparatus according to claim 5, wherein the user input means comprises a keyboard means.
7. An apparatus according to claim 6, wherein the keyboard means comprises a membrane keyboard.
8. An apparatus according to claim 5, wherein the user input means is distributed between said portions.



9. An apparatus according to claim 6 or 7, wherein the keyboard means comprises a plurality of keys mounted to a panel, the panel being pivotable between a first position substantially flat with respect to a body portion and a second position angled away from the body portion.
- 5 10. An apparatus according to claim 9, wherein said panel is arranged to pivot about an axis adjacent to the lower edge of said portion.
11. An apparatus according to claim 5, wherein the user input means  
10 comprises a plurality of tilt switches, a plurality of different characters being represented by the making of respective contacts of said switches.
18. An apparatus substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.
- 15 19. An apparatus substantially as hereinbefore described with reference to Figures 7 to 11 of the accompanying drawings.
20. An apparatus substantially as hereinbefore described with reference to  
20 Figures 12 and 13 of the accompanying drawings.
21. An apparatus substantially as hereinbefore described with reference to Figures 14 of the accompanying drawings.



Application No: GB 9612262.7  
Claims searched: 1-12, 18-23

Examiner: B G Western  
Date of search: 14 May 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4A ADT ; H4L LECX

Int Cl (Ed.6): G06F 1/16 3/023 15/02 ; H04B 1/03 1/08 1/38 ;  
H04M 1/02 1/03 1/23 1/72 ; H05K 7/00

Other: On-line databases: COMPUTER, INSPEC, WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP-0665508-A2 (SYNAPTICS) N.b. cols 27-30, Figs 11-17	1,2,8,10
X	US-5515305-A (REGISTER et al) See whole document	1,8,9
X	US-5432496-A (LIN) See whole document	1,8,9
X	DE-4230125-A (ADRIAN), 10.03.94, (see WPI abstract Accession No. 009804661)	1,8,9
X	JP-07295720-A (NTT DATA TSUSHIN), 10.11.95, (see abstract from Patent Abstracts of Japan, Mar 96 CD-ROM)	1,8,9

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.  
& Member of the same patent family

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.



Application No: GB 9612262.7  
Claims searched: 13-16 inter alia

Examiner: B G Western  
Date of search: 14 May 1997

**Patents Act 1977**  
**Further Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4A ADT ; H4L LECX

Int Cl (Ed.6): G06F 1/16 3/147 15/02 ; H04B 1/03 1/08 1/38 ;  
H04M 1/02 1/03 1/72 ; H05K 7/00

Other: On-line databases: COMPUTER, INSPEC, WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage			Relevant to claims
X	EP-0618715-A1	KK ACE DENKEN	See whole document	13
X	US-5467102-A	KUNO et al	See whole document	13
X	US-5388061-A	HANKES	N.b. Figure 1	13

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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